# 1AC: Warming

#### Scientific consensus on anthropogenic warming

Anderegg et al 10 [William, Professor of Biology at Stanford University; James W. Prall, Electrical and Computer Engineering, University of Toronto; Jacob Harold, William and Flora Hewlett Foundation; Stephen H. Schneider, Professor of Biology at Stanford University, Senior Fellow at the Woods Institute for the Environment, "Expert credibility in climate change," 5-9, PNAS, vol 107, no 27, http://www.pnas.org/content/107/27/12107.full.pdf+html]

Preliminary reviews of scientiﬁc literature and surveys of climate scientists indicate striking agreement with the primary conclusions of the Intergovernmental Panel on Climate Change (IPCC): anthropogenic greenhouse gases have been responsible for “most” of the “unequivocal” warming of the Earth’s average global temperature over the second half of the 20th century (1–3). Nonetheless, substantial and growing public doubt remains about the anthropogenic cause and scientiﬁc agreement about the role of anthropogenic greenhouse gases in climate change (4, 5). A vocal minority of researchers and other critics contest the conclusions of the mainstream scientiﬁc assessment, frequently citing large numbers of scientists whom they believe support their claims (6–8). This group, often termed climate change skeptics, contrarians, or deniers, has received large amounts of media attention and wields signiﬁcant inﬂuence in the societal debate about climate change impacts and policy (7, 9–14). An extensive literature examines what constitutes expertise or credibility in technical and policy-relevant scientiﬁc research (15). Though our aim is not to expand upon that literature here, we wish to draw upon several important observations from this literature in examining expert credibility in climate change. First, though the degree of contextual, political, epistemological, and cultural inﬂuences in determining who counts as an expert and who is credible remains debated, many scholars acknowledge the need to identify credible experts and account for expert opinion in technical (e.g., science-based) decision-making (15–19). Furthermore, delineating expertise and the relative credibility of claims is critical, especially in areas where it may be difﬁcult for the majority of decision-makers and the lay public to evaluate the full complexities of a technical issue (12, 15). Ultimately, however, societal decisions regarding response to ACC must necessarily include input from many diverse and nonexpert stakeholders. Because the timeline of decision-making is often more rapid than scientiﬁc consensus, examining the landscape of expert opinion can greatly inform such decision-making (15, 19). Here, we examine a metric of climate-speciﬁc expertise and a metric of overall scientiﬁc prominence as two dimensions of expert credibility in two groups of researchers. We provide a broad assessment of the relative credibility of researchers convinced by the evidence (CE) of ACC and those unconvinced by the evidence (UE) of ACC. Our consideration of UE researchers differs from previous work on climate change skeptics and contrarians in that we primarily focus on researchers that have published extensively in the climate ﬁeld, although we consider all skeptics/contrarians that have signed prominent statements concerning ACC (6–8). Such expert analysis can illuminate public and policy discussions about ACC and the extent of consensus in the expert scientiﬁc community. We compiled a database of 1,372 climate researchers based on authorship of scientiﬁc assessment reports and membership on multisignatory statements about ACC (SI Materials and Methods). We tallied the number of climate-relevant publications authored or coauthored by each researcher (deﬁned here as expertise) and counted the number of citations for each of the researcher’s four highest-cited papers (deﬁned here as prominence) using Google Scholar. We then imposed an a priori criterion that a researcher must have authored a minimum of 20 climate publications to be considered a climate researcher, thus reducing the database to 908 researchers. Varying this minimum publication cutoff did not materially alter results (Materials and Methods). We ranked researchers based on the total number of climate publications authored. Though our compiled researcher list is not comprehensive nor designed to be representative of the entire climate science community, we have drawn researchers from the most high-proﬁle reports and public statements about ACC. Therefore, we have likely compiled the strongest and most credentialed researchers in CE and UE groups. Citation and publication analyses must be treated with caution in inferring scientiﬁc credibility, but we suggest that our methods and our expertise and prominence criteria provide conservative, robust, and relevant indicators of relative credibility of CE and UE groups of climate researchers (Materials and Methods). Results and Discussion The UE group comprises only 2% of the top 50 climate researchers as ranked by expertise (number of climate publications), 3% of researchers of the top 100, and 2.5% of the top 200, excluding researchers present in both groups (Materials and Methods). This result closely agrees with expert surveys, indicating that ≈97% of self-identiﬁed actively publishing climate scientists agree with the tenets of ACC (2). Furthermore, this ﬁnding complements direct polling of the climate researcher community, which yields qualitative and self-reported researcher expertise (2). Our ﬁndings capture the added dimension of the distribution of researcher expertise, quantify agreement among the highest expertise climate researchers, and provide an independent assessment of level of scientiﬁc consensus concerning ACC. In addition to the striking difference in number of expert researchers between CE and UE groups, the distribution of expertise of the UE group is far below that of the CE group (Fig. 1). Mean expertise of the UE group was around half (60 publications) that of the CE group (119 publications; Mann–Whitney U test: W = 57,020; P < 10 −14 ), as was median expertise (UE = 34 publications; CE = 84 publications) Furthermore, researchers with fewer than 20 climate publications comprise ≈80% the UE group, as opposed to less than 10% of the CE group. This indicates that the bulk of UE researchers on the most prominent multisignatory statements about climate change have not published extensively in the peer-reviewed climate literature. We examined a subsample of the 50 most-published (highestexpertise) researchers from each group. Such subsampling facilitates comparison of relative expertise between groups (normalizing differences between absolute numbers). This method reveals large differences in relative expertise between CE and UE groups (Fig. 2). Though the top-published researchers in the CE group have an average of 408 climate publications (median = 344), the top UE researchers average only 89 publications (median = 68; Mann– Whitney U test: W = 2,455; P < 10 −15 ). Thus, this suggests that not all experts are equal, and top CE researchers have much stronger expertise in climate science than those in the top UE group. Finally, our prominence criterion provides an independent and approximate estimate of the relative scientiﬁc signiﬁcance of CE and UE publications. Citation analysis complements publication analysis because it can, in general terms, capture the quality and impact of a researcher’s contribution—a critical component to overall scientiﬁc credibility—as opposed to measuring a researcher’s involvement in a ﬁeld, or expertise (Materials and Methods). The citation analysis conducted here further complements the publication analysis because it does not examine solely climate relevant publications and thus captures highly prominent researchers who may not be directly involved with the climate ﬁeld. We examined the top four most-cited papers for each CE and UE researcher with 20 or more climate publications and found immense disparity in scientiﬁc prominence between CE and UE communities (Mann–Whitney U test: W = 50,710; P < 10 −6 ; Fig. 3). CE researchers’ top papers were cited an average of 172 times, compared with 105 times for UE researchers. Because a single, highly cited paper does not establish a highly credible reputation but might instead reﬂect the controversial nature of that paper (often called the single-paper effect), we also considered the average the citation count of the second through fourth most-highly cited papers of each researcher. Results were robust when only these papers were considered (CE mean: 133; UE mean: 84; Mann–Whitney U test: W = 50,492; P < 10 −6 ). Results were robust when all 1,372 researchers, including those with fewer than 20 climate publications, were considered (CE mean: 126; UE mean: 59; Mann–Whitney U test: W = 3.5 × 10 5 ; P < 10 −15 .( Number of citations is an imperfect but useful benchmark for a group’s scientiﬁc prominence (Materials and Methods), and we show here that even considering all (e.g., climate and nonclimate) publications, the UE researcher group has substantially lower prominence than the CE group. We provide a large-scale quantitative assessment of the relative level of agreement, expertise, and prominence in the climate researcher community. We show that the expertise and prominence, two integral components of overall expert credibility, of climate researchers convinced by the evidence of ACC vastly overshadows that of the climate change skeptics and contrarians. This divide is even starker when considering the top researchers in each group. Despite media tendencies to present both sides in ACC debates (9), which can contribute to continued public misunderstanding regarding ACC (7, 11, 12, 14), not all climate researchers are equal in scientiﬁc credibility and expertise in the climate system. This extensive analysis of the mainstream versus skeptical/contrarian researchers suggests a strong role for considering expert credibility in the relative weight of and attention to these groups of researchers in future discussions in media, policy, and public forums regarding anthropogenic climate change.

#### Electricity sector and CO2 are key

**Ferrey et al. ’10** (Steven, law prof at Suffolk, Chad Laurent JD at Suffolk, Cameron Ferrey president of Computers Across Borders, “Fire and Ice: World Renewable Energy and Carbon Control Mechanisms Confront Constitutional Barriers,” 20 Duke Envtl. L. & Pol'y F. 125)

At the height of the last Ice Age, temperatures were only 5 [degrees] C cooler than now. n15 Therefore, an increase of the magnitude predicted by the IPCC would be a major move. "Eleven of the past twelve years have been among the warmest dozen years on record". n16 GHG emissions in the 21st century are mainly a result of power generation. n17 The U.S. Environmental Protection Agency reports that approximately forty percent of aggregate U.S. carbon emissions contributing to climate change are related to coal-fired power generation. n18 The single-point nature of power plant emissions, and the exploding demand for electricity, make electricity-generating plants a logical choice for the regulation of GHG emissions in the United States. Carbon dioxide is the primary GHG emitted by human activities in the United States, representing approximately 83.9% of total GHG emissions. n19 "The largest source of CO(2), and of overall greenhouse gas emissions, is fossil fuel combustion." n20 Thirty-six percent of that fossil fuel consumption, and in turn roughly forty percent of the CO(2) [\*131] from fossil fuel combustion, is from electricity generators. n21 "Electricity generators rely on coal for over half of their total energy requirements." n22 Therefore, any successful GHG emission reduction plan will rely on reduction from the electricity sector.

#### Energy demand increasing

**Mormann ’11** (Felix, prof at Steyer-Taylor Center for Energy Policy and Finance, Stanford Law School, “Requirements for a Renewables Revolution,” 38 Ecology L.Q. 903)

With U.S. and global electricity generation expected to increase by 22 percent and 74 percent respectively until 2030, n32 any effort to significantly reduce greenhouse gas emissions must include major reforms in the electricity sector. A timely shift to renewable sources is the only long-term sustainable solution presently available. n33 Moreover, the projected growth in electricity generation will easily be surpassed if the current trend towards electric vehicles (e.g., plug-in hybrids) continues. n34 The resulting large-scale electrification of [\*912] the transport sector would further increase the need for a timely decarbonization of the electricity sector. Otherwise greenhouse gas emissions may merely move from one sector (transport) to another, only slightly less carbon-intensive sector (electricity). While improvements in energy efficiency will also be important, n35 the timely shift to renewables is essential if current efforts in climate change mitigation are to be successful. n36

Fortunately, the case for rapid large-scale deployment of renewables in the electricity sector is not one of necessity only but of potential, too. In comparison to the fragmented structure of the heat-relevant building sector, for instance, the electricity sector is relatively centralized and, hence, easier to regulate and reform. n37 Indeed, a recent study found that meeting the world's entire demand with electricity generated from water, wind, and sunlight is technologically feasible as early as twenty years from today. n38 Accordingly, this Article focuses on the use of renewables for the generation of electricity.

#### New Renewables Can displace current emissions

**Rossi ’10** (Jim, law prof at FSU, “The Future of Energy Policy: A National Renewable Portfolio Standard: The Limits of a National Renewable Portfolio Standard,” 42 Conn. L. Rev. 1425)

The strongest case for renewables having a limited substitution effect may be in markets where the demand for electricity is increasing and utilities possess excess transmission capacity. If the demand is increasing, new renewables could allow the utility to avoid building a new power plant. Adding renewables to the grid would offset the need to build some (if not all) new fossil fuel-fired generation. n50 As Professor Davies highlights, some argue that a national RPS could increase demand for [\*1440] conventional generation. Facilities that rely on intermittently available resources, particularly wind, cannot be guaranteed to be available when a utility needs them. Assuming that demand is growing in a way that offsets any substitution away from natural gas for cost and operation reasons, some believe that this could actually increase demand for natural gas fired generation. n51 Others observe that, in terms of new capacity, solar and wind facilities can be deployed more quickly than natural gas plants, which face longer lead times for permitting and other matters, n52 although it is not clear that this claim is correct. n53 In addition, intermittency concerns with resources such as wind can be alleviated if a large number of wind turbines are spread around the state in windy areas, increasing the chances that some of them generate electricity at the right moment. A utility might well conclude that the increased geographical dispersion of renewable energy facilities could actually increase the reliability of its system as a whole, although this requires a transmission system with sufficient capacity to accommodate renewables. n54

#### A Solution requires fast shift to renewables

Mormann ’11 (Felix, prof at Steyer-Taylor Center for Energy Policy and Finance, Stanford Law School, “Requirements for a Renewables Revolution,” 38 Ecology L.Q. 903)

Climate change has turned the transition to renewable energy sources into one of the world's key challenges of the twenty-first century. n1 If we are to limit global warming to a temperature increase of no more than two degrees Celsius from pre-industrialization levels, today's high-carbon economy must turn low-carbon by 2050. n2 This will require a complete and rapid transformation of the energy sector. n3 Yet, current projections forecast that renewable energy sources (renewables) will account for no more than 16 percent of American electricity generation in 2035. n4 In other words, our business-as-usual trajectory is too slow to limit global warming to two degrees Celsius, despite the American public's widespread awareness of and concern about climate change. n5

The transition to renewable sources of energy has long ceased to be of solely environmental relevance but, instead, claims constantly more economic importance. American dependence on foreign oil drives up the U.S. trade [\*906] deficit, with daily imports worth $ 1 billion. n6 The 2008 oil price shock cost the U.S. economy some $ 500 billion. n7 At the same time, the low-carbon energy market promises huge growth potential. Worldwide investment in solar energy for instance increased by more than 250 percent annually from 2004 to 2008. n8 Clean technology and renewable energy were the only segments to experience growth in venture capital investment amidst the 2008/09 economic downturn. n9

#### Market forces are too slow – rate structure incentives are key to rapid transition

**Mormann ’11** (Felix, prof at Steyer-Taylor Center for Energy Policy and Finance, Stanford Law School, “Requirements for a Renewables Revolution,” 38 Ecology L.Q. 903)

The world's decreasing oil reserves, ever stricter air pollution regulation, and struggles over supply channels for coal and natural gas across the globe lead to increasing prices for electricity derived from fossil fuels. n39 At the same time, technological advances drive down the cost of electricity generated from renewable sources of energy. n40 The question, therefore, is whether market forces alone can bring about the transition from fossil fuels to renewable sources of energy. Indeed, it seems to be only a matter of time before the more mature renewables technologies become cost-competitive with fossil fuels. Under favorable conditions, the production cost of electricity from onshore wind turbines is already competitive with that of many coal-fired plants. n41 [\*913] **Nonetheless,** market forces **alone appear insufficient to drive the shift to renewables in the global and U.S. electricity mix at the speed necessary for successful climate change mitigation.** n42

Today's high-carbon economy must turn low-carbon by 2050 in order to limit global warming to a temperature increase of no more than two degrees Celsius (3.6 degrees Fahrenheit) from pre-industrialization levels. n43 Several peer-reviewed studies of climate change indicate the two-degree scenario as a crucial milestone to limit the likelihood of massive and irreversible disruptions of the global ecosystem. n44 Following these studies, the Intergovernmental Panel on Climate Change correlates the two-degree scenario with a stabilization of the atmospheric greenhouse gas concentration below 440 parts per million. n45 The necessary rate of renewables deployment to achieve this stabilization level depends upon a variety of factors, including the overall energy consumption, energy efficiency measures, the choice of conventional fuels and their carbon intensity. Model scenarios require a global renewable energy share of up to 43 percent by 2030 and 77 percent by 2050. n46 According to the International Energy Agency (IEA), "to achieve this[] would require a complete and rapid transformation of the energy sector." n47 Yet, even the European Union (E.U.), one of the world's most zealous advocates of a timely transition to renewables, assumes a share of no more than 20 percent for renewable energy sources in the energy mix of its twenty-seven member states by 2020, based on a business-as-usual scenario. n48 In fact, the [\*914] E.U. member states plan to commission fifty new coal-fired power plants in the near future, and these plants will likely remain on the grid for up to fifty years. n49 Current projections by the U.S. Energy Information Administration predict a very gradual shift to lower carbon options n50 - too slow to limit global warming to two degrees Celsius. Already, some climate change researchers already doubt whether the current policy landscape will be able to keep global warming below three degrees Celsius. n51 The economic literature tends to attribute the relatively moderate market-driven growth of renewables' share in the electricity mix of the European Union, the United States, and elsewhere in the world to market failures. Along with other imperfections and characteristics of the electricity market, these failures are perceived to favor incumbent fossil fuel technologies and thus block the rise of renewables. This Part discusses the most widely blamed market failures, imperfections, and other characteristics in the context of the U.S. electricity market. The discussion places special emphasis on the role of regulatory obstacles. Based on their alleged impact on the timely transition to renewables, I have categorized these obstacles into impediments to innovation, discussed in Part II.A, and barriers to renewables' entry into the electricity market, discussed in Parts II.B and II.C. A. Impediments to Innovation. Most renewable energy technologies have not yet reached the stage of market maturity. n52 The diversified portfolio of **renewables** favored by environmentalists and advocates of energy security **will not be available without substantial research and innovation.** n53 In addition, many of the more mature technologies, including onshore wind and solar photovoltaic, cannot be successfully integrated into the on-grid electricity market without further technological advances in related fields, such as energy storage and [\*915] transmission. n54 Finally, continuous research and innovation, including the exploration of new, hitherto purely conceptual technologies, are essential to ensure that the shift away from fossil fuels to renewables does not replace one path dependency with another by focusing on too few renewable energy technologies. n55 The transport sector provides an instructive example of the risks involved in prematurely narrowing climate change mitigation efforts to a single technology: the recent focus on biofuels derived from corn, sugar cane, and other food crops - praised by some as the transport sector's energy panacea - resulted in a crop scarcity that drove food prices up to a level that threatened to bring famine to many developing countries. n56 The need for further innovation in renewables is exacerbated by traditionally low levels of research and development (R&D) in the energy sector. In 2007, the R&D intensity n57 of U.S. energy firms was at 0.23 percent while other industries, such as information technology (15 percent), semiconductors (16 percent), and pharmaceuticals (20 percent) featured a several orders of magnitude higher R&D intensity. n58 After a brief surge following the 1970s oil crisis, private and public energy R&D expenditures have declined consistently. n59 Private R&D expenditures are driven by the firm's expected returns on investment. The energy sector's low level of R&D investment indicates the presence of impediments to the firm's ability to profit from innovation, which discourage the firm's innovative efforts. Some of these impediments, such as spillover effects, as discussed in Part II.A.1, point to general market failures related to innovation with particular implications for renewables. Others, like the prevailing regime of electricity rate regulation, as discussed in Part II.A.2, appear to be specific to the innovative process in [\*916] renewables. Finally, the dearth of outside funding, as discussed in Part II.A.3, exacerbates the problem of insufficient R&D investment in renewables. 1. Spillover Effects. Spillover effects are among the most common market failures responsible for an undersupply of innovation. When a firm invests in a new technology, it is generally unable to reap all of the resulting benefits for itself, but creates benefits for others, too. Yet the firm bears the entire cost. As a result of this spillover effect, profit-oriented firms will keep their investments in innovation below the socially optimal level. The benefits subject to such spillover usually involve the knowledge and learning experience a firm has acquired through its innovation efforts. n60 Knowledge spillover is not a problem specific to renewables, but is innate in all innovative efforts, and affects the energy industry just as much as the pharmaceuticals, semiconductor, or automotive sectors. Yet, all of these sectors feature R&D intensities several orders of magnitude higher than the energy sector. n61 One could argue, therefore, that knowledge spillover should not represent a major impediment to innovation in the renewables nexus. This view, however, underestimates the special characteristics of the electricity market - a market dominated by powerful incumbents with little interest in out-innovating their established fossil-fuel power-generation infrastructure. Thanks to their substantial resources, these incumbents can wait to jump on the energy innovation bandwagon once it has gathered momentum. n62 In addition to the general issue of knowledge spillover, innovation in renewable energy technologies is prone to another, industry-specific spillover effect: so long as high-carbon energy technologies are not held accountable for their emissions, they will continue to externalize the environmental costs of their activities. Just as these environmental costs are borne by society at large, so will the environmental benefits created by renewable energy technologies accrue to the general public. Ratepayers will be reluctant to pay a premium for electricity from renewables so as not to offer a free ride to those who continue to rely on cheaper electricity from polluting fossil fuels. n63 As a result of this environmental spillover effect, innovators in the renewables nexus have a hard time cashing in on their innovative achievements. n64 [\*917] 2. Rate Regulation Discourages In-House Innovation. **The general disincentivizing force of fossil fuels' environmental externalities on investment in renewables innovation could be remedied**, at least in part, **if the established and powerful energy incumbents had sufficient incentives for in-house renewables innovation**. That way, those who benefit most from the hidden subsidy of environmental externalization could use their windfall profits to innovate toward the transition to renewables. Such vertically integrated approaches to innovation are, however, few and far between, as evidenced by the energy sector's low R&D intensity**. In the absence of consistent, long-term support policies, the current rate structure in the electricity market tends to discourage investment in R&D for emerging renewables technologies.** Subject to approval by the Federal Energy Regulatory Commission (FERC), which regulates the wholesale market, and State Public Utilities Commissions, which regulate the retail market, electricity rates in the United States are generally based on rate-of-return regulation. Under this regulatory approach, the responsible commissions approve electricity rates based on the cost of service, offering an allowed rate of return to the electric utilities companies. While **this rate structure** encourages capital expenditures beyond the socially optimal level, known as the Averch-Johnson effect, n65 it **does not** necessarily **incentivize R&D investment**. In fact, the commissions rarely include R&D expenditures in their rate-base calculations or allow utilities to earn a return on investment on them. n66 It is hardly surprising therefore that several studies have shown regulation to be harmful to utilities' R&D spending and innovation. n67 Historically, equipment manufacturers and the federal government - not utilities - have been the drivers of technological innovation in the U.S. electricity industry. n68 As early as 1969, now-Judge Posner warned of the effects of rate regulation on innovation: There would be no monopoly profits under such a regime, but neither would there be any incentive on the part of the monopolist to improve his efficiency. Lacking either the "stick" of competitive pressure or the "carrot" of supracompetitive profits, the managers of the firm would have no reason to strive for better performance save their own pride or professionalism. n69 Even if utility companies do engage in R&D, they are likely to focus on areas with high short-term potential for commercialization, thus excluding most [\*918] renewables technologies. n70 Electric utilities with the resources for in-house innovation may well decide to wait until extrasectorial efforts advance renewable energy technologies sufficiently for commercial application. In fact, large, vertically integrated incumbents have a strong motivation to delay renewables innovation as much as possible so as not to depreciate the value of their existing electricity-generation assets. n71 Relying on their position of market power and their considerable resources, they can afford to wait until extrasectorial innovation brings emerging technologies to maturity to then jump on the bandwagon through, for example, licensing, reverse engineering, or company take-overs. n72 FERC's recent ruling on California's proposed feed-in tariff reflects both the necessity of policy support for innovation and strategic deployment of renewables as well as the difficulty of its implementation under the existing regulatory framework. n73 3. Difficulty to Raise Outside Funding. The characteristics of the energy sector in general, and of renewables in particular, make them ill-suited for traditional models of outside funding, such as the venture capital that has proven a successful driver of innovation in the information technology sector. Outside investors are not only wary of the risks resulting from the double spillover effects illustrated above, but are also reluctant to invest in technologies whose economic success depends largely on the regulatory choices of policymakers. n74 **This reluctance is exacerbated by** a history of **policy choices that have lacked the consistency required to afford the necessary investment certainty.** The sequence of boom and bust cycles resulting from intermittent tax support for U.S. wind energy projects is a prime example of the destructive effects of this lack of policy certainty. n75 As a result, investors demonstrate a relatively high level of risk-aversion regarding investments in renewable energy. Finally, many of the technologies required to facilitate a successful transition to renewables involve innovative efforts of such scale and complexity [\*919] that they exceed most outside investors' patience. Venture capital funds, for instance, are expected to yield returns to their investors within a period of no more than five to ten years. n76 In light of the energy sector's history of long learning processes, n77 it is doubtful whether renewable energy technologies, **without policy assistance**, can attract the venture capital or other private investment necessary to bridge the notoriously long valley of death between proof of concept and late-stage development. The current level of venture capital investment in renewable energy technologies, although on the rise, is **far from sufficient** to satisfy the sector's need for capital infusion. n78 B. Marketplace Barriers to Entry Impediments to the innovative process are not the only obstacles to a timely transition from fossil fuels to renewable sources of energy. Even when the level of innovation is such that renewable energy technologies become mature enough for their large-scale deployment, they have to overcome a number of economic barriers to successfully enter the electricity generation market. Where renewables compete with fossil fuels, they encounter an uneven playing field, tilted in favor of long-established, deeply entrenched incumbents. The latter benefit from a history of fossil fuel subsidies, discussed in Part II.B.1, a lack of product differentiation, discussed in Part II.B.2, and structural peculiarities of the electricity market, discussed in Part II.B.3. 1. A History of Fossil Fuel Subsidies Across the globe, the generation of electricity from fossil fuels has long received and continues to receive substantial government subsidies, both direct and indirect. In fact, direct financial support for fossil fuels is estimated at $ 150 billion to $ 250 billion annually worldwide. n79 In addition, producers of electricity from fossil fuels benefit from a multitude of indirect subsidies, ranging from tax privileges over export credit guarantees to government underwriting of power plant accidents. n80 Most of all, in the absence of an emissions tax or a cap-and-trade system, energy incumbents are permitted to shift the environmental costs of their activities to society at large. [\*920] Subsidies tend to be highest in developing and transition economies to keep domestic electricity rates low for the benefit of low-income households. n81 In practice, however, these rates mostly benefit affluent households and industrial electricity consumers, who tend to consume more electricity. Thus, these energy subsidies tend to foster increased energy consumption while delaying investment in energy efficiency and renewable energy technologies. n82 They have brought forth economically and politically powerful energy incumbents and given rise to a political culture that assumes fossil fuels to be the basis of the economy. n83 The result, in the words of two commentators, is a deeply felt public sense of entitlement "that cheap and readily available energy is part of the American birthright." n84 2. Lack of Product Differentiation **The distortive effects of government subsidies on electricity rates are all the more problematic for producers of electricity from renewable energy sources as they are forced to compete with fossil fuel incumbents primarily on price.** In the absence of a tax on emissions or a cap-and-trade system, renewable energy technologies appear to deliver the same product - electricity - as polluting, fossil fuel technologies, at least in the eyes of most consumers. As two commentators put it: "Liberalisation has transformed electricity from a public service to a commodity which is technically homogeneous." n85 In other words, consumers cannot normally distinguish a green electron from one dressed in charcoal grey. n86 Some utilities offer special rates for electricity from renewables aimed at consumers who are environmentally conscious enough - and wealthy enough - to pay a premium for green electricity. n87 However, demand for these programs has been much lower than surveys had previously indicated. While one in three electricity consumers had expressed a willingness to pay extra for clean energy, far fewer eventually subscribed to a more expensive, renewables-based electricity rate plan. n88 In contrast to the information technology or telecommunication sectors, product differentiation, such as through reduction in size or enhanced functionality, is not among the marketing instruments readily available to [\*921] producers of electricity from renewable sources of energy. n89 Without distinguishing properties visible to the outside world, such as neighbors, friends, or clients, environmental enthusiasts paying extra for clean electricity likely feel cheated out of the recognition their efforts deserve. n90 This trend is all the more unfortunate as, in economic terms, a cleaner environment is a public good whose lack of appropriability implies that demand for green electricity sold at a premium will fall short of the socially optimal level. n91 3. The Electricity Market's Physical and Virtual Barriers to Entry Other barriers to the entry of renewables relate to the market structure of the electricity sector. Despite recent efforts to deregulate and liberalize the sector, the regionally or nationally defined power generation markets around the world still tend to be dominated by a limited number of big players, and in some cases by only one formerly government-run utilities company. n92 In the absence of special incentives, these incumbents will be reluctant to give up their costly, well-established infrastructure of fossil fuel power plants for an increased share of renewables in their energy portfolio. **Producers of electricity from renewable sources who enter the market will likely find themselves in a competition similar to** that of **David versus Goliath.** To make matters worse, they need access to the grid in order to sell their power. Electricity distribution, however, represents a natural monopoly. n93 Without a strong regulatory obligation to grant grid access to incoming players, producers of electricity from renewables are therefore left at the mercy of local network operators, who themselves tend to be electricity producers eager to eliminate additional competition. n94

#### **Plan rapidly cuts into fossil fuels**

Alliance for Renewable Energy May 17, 2008, Why FITs?

http://www.allianceforrenewableenergy.org/2008/05/why-fits.html

Fits will speed up our shift from fossil fuels to clean renewable energy. IN THIS WAY, fits will also: -- protect our health We will be putting less particulates into the air since we will be burning less oil, coal and natural gas. This will mean less suffering from asthma and other breathing disorders and reduced medical and health insurance costs. -- Reduce Global Warming Burning fossil fuels releases 75% of the greenhouse gases that are heating the planet. It is estimated that by switching to renewable energy we can cut CO2 emissions in half by 2030. In 2006, with REPs in place, Germany alone saved 100 million tons of CO2 from entering the atmosphere.

#### US environmental leadership is key to creating global action

Ivanova and Esty, 2008

Maria Ivanova, PhD, Assistant Professor at McCormack Graduate School, Director of the Global Environmental Governance Project and Daniel C. Esty, Professor of Environmental Law and Policy at Yale Law School “Reclaiming U.S. Leadership in Global Environmental Governance”, Summer-Fall 2008, SAIS Review vol. XXVII no. 2, accessed July 5, 2012 from <http://www.umb.edu/editor_uploads/images/centers_institutes/center_governance_sustain/Ivanova-Esty-SAISReview-2008.pdf>

We contend, moreover, that not only is U.S. participation critical, but U.S. leadership is crucial and necessary to achieve successful environmental outcomes. The U.S. environmental footprint is larger than any other country’s. The United States consumes a disproportionate share of the world’s energy and natural resources. With less than 5 percent of the world population, the United States uses 25 percent of the world’s fossil fuel resources—accounting for nearly 25 percent of the world’s annual coal burning, 26 percent of the world’s oil, and 27 percent of the world’s natural gas.3 It also accounts for 18.5 percent of the consumption of global forestry products and 13.7 percent of the world’s water usage. The United States is in a unique position. Given its economic and strategic power as well as its financial and technological prowess, U.S. leadership could influence international environmental policy and promote effective environmental governance. Conversely, the record of the past fifteen years has demonstrated that “when the United States declines to exercise leadership, the impact is significant.”4 Little progress is made without the United States.

#### Worst-case warming results in extinction

Ahmed 2010 (Nafeez Ahmed, Executive Director of the Institute for Policy Research and Development, professor of International Relations and globalization at Brunel University and the University of Sussex, Spring/Summer 2010, “Globalizing Insecurity: The Convergence of Interdependent Ecological, Energy, and Economic Crises,” Spotlight on Security, Volume 5, Issue 2, online)

Perhaps the most notorious indicator is anthropogenic global warmings warming. The landmark 2007 Fourth Assessment Report of the UN Intergovernmental Panel on Climate Change (IPCC) – which warned that at then-current rates of increase of fossil fuel emissions, the earth’s global average temperature would likely rise by 6°C by the end of the 21st century creating a largely uninhabitable planet – was a wake-up call to the international community.[v] Despite the pretensions of ‘climate sceptics,’ the peer-reviewed scientific literature has continued to produce evidence that the IPCC’s original scenarios were wrong – not because they were too alarmist, but on the contrary, because they were far too conservative. According to a paper in the Proceedings of the National Academy of Sciences, current CO2 emissions are worse than all six scenarios contemplated by the IPCC. This implies that the IPCC’s worst-case six-degree scenario severely underestimates the most probable climate trajectory under current rates of emissions.[vi] It is often presumed that a 2°C rise in global average temperatures under an atmospheric concentration of greenhouse gasses at 400 parts per million (ppm) constitutes a safe upper limit – beyond which further global warming could trigger rapid and abrupt climate changes that, in turn, could tip the whole earth climate system into a process of irreversible, runaway warming.[vii] Unfortunately, we are already well past this limit, with the level of greenhouse gasses as of mid-2005 constituting 445 ppm.[viii] Worse still, cutting-edge scientific data suggests that the safe upper limit is in fact far lower. James Hansen, director of the NASA Goddard Institute for Space Studies, argues that the absolute upper limit for CO2 emissions is 350 ppm: “If the present overshoot of this target CO2 is not brief, there is a possibility of seeding irreversible catastrophic effects.”[ix] A wealth of scientific studies has attempted to explore the role of positive-feedback mechanisms between different climate sub-systems, the operation of which could intensify the warming process. Emissions beyond 350 ppm over decades are likely to lead to the total loss of Arctic sea-ice in the summer triggering magnified absorption of sun radiation, accelerating warming; the melting of Arctic permafrost triggering massive methane injections into the atmosphere, accelerating warming; the loss of half the Amazon rainforest triggering the momentous release of billions of tonnes of stored carbon, accelerating warming; and increased microbial activity in the earth’s soil leading to further huge releases of stored carbon, accelerating warming; to name just a few. Each of these feedback sub-systems alone is sufficient by itself to lead to irreversible, catastrophic effects that could tip the whole earth climate system over the edge.[x] Recent studies now estimate that the continuation of business-as-usual would lead to global warming of three to four degrees Celsius before 2060 with multiple irreversible, catastrophic impacts; and six, even as high as eight, degrees by the end of the century – a situation endangering the survival of all life on earth.[xi]

#### No adaption to worst case – the impact is extinction

Tickell 8 (Oliver, Environmental Researcher, The Guardian, August 11, <http://www.guardian.co.uk/commentisfree/2008/aug/11/climatechange>, JMB, accessed 6-23-11)

We need to get prepared for four degrees of global warming, Bob Watson told the Guardian last week. At first sight this looks like wise counsel from the climate science adviser to Defra. But the idea that we could adapt to a 4C rise is absurd and dangerous. Global warming on this scale would be a catastrophe that would mean, in the immortal words that Chief Seattle probably never spoke, "the end of living and the beginning of survival" for humankind. Or perhaps the beginning of our extinction**.** The collapse of the polar ice caps would become inevitable, bringing long-term sea level rises of 70-80 metres. All **the world's coastal plains would be lost, complete with** ports, cities, transport and **industrial infrastructure, and much of the world's** most productive **farmland.** The world's geography would be transformed much as it was at the end of the last ice age, when sea levels rose by about 120 metres to create the Channel, the North Sea and Cardigan Bay out of dry land. **Weather would become extreme and unpredictable, with more frequent and severe droughts, floods and hurricanes. The Earth's carrying capacity would be hugely reduced. Billions would undoubtedly die.** Watson's call was supported by the government's former chief scientific adviser, Sir David King, who warned that "if we get to a four-degree rise it is quite possible that we would begin to see a runaway increase". This is a remarkable understatement. The climate system is already experiencing significant feedbacks, notably the summer melting of the Arctic sea ice. The more the ice melts, the more sunshine is absorbed by the sea, and the more the Arctic warms. And as the Arctic warms, the release of billions of tonnes of methane – a greenhouse gas 70 times stronger than carbon dioxide over 20 years – captured under melting permafrost is already under way. To see how far this process could go, look 55.5m years to the Palaeocene-Eocene Thermal Maximum, when a global temperature increase of 6C coincided with the release of about 5,000 gigatonnes of carbon into the atmosphere, both as CO2 and as methane from bogs and seabed sediments. Lush subtropical forests grew in polar regions, and sea levels rose to 100m higher than today. It appears that an initial warming pulse triggered other warming processes. Many scientists warn that this historical event may be analogous to the present**: the warming caused by human emissions could propel us towards a similar hothouse Earth**

#### Increased CO2 causes ocean acidification

Venkataramanan and smitha ‘11(Department of Economics, D.G. Vaishnav College, Chennai, India Indian Journal of Science “Causes and effects of global warming p.226-229 March 2011 <http://www.indjst.org/archive/vol.4.issue.3/mar11-pages159-265.pdf>)

Causes of global warming: The buildup of carbon dioxide in the atmosphere, mainly from your fossil fuel emissions, is the most significant human cause of global warming. Carbon dioxide is released every you burn something, be it a car, airplane or coal plant. This means you must burn less fossil fuel if you want the Earth's climate to remain stable! And unfortunately, we are currently destroying some of the best known mechanisms for storing that carbon—plants. Deforestation increases the severity of global warming as well. Carbon dioxide is released from the human conversion of forests and grasslands into farmland and cities. All living plants store carbon. When those plants die and decay, carbon dioxide is released back into the atmosphere. As forests and grasslands are cleared for your use, enormous amounts of stored carbon enter the atmosphere. An unstoppable feedback loop may happen if you let this continue. If the activities mentioned above warm the Earth just enough, it could cause natural carbon sinks to fail. A "carbon sink" is a natural system that stores carbon over thousands of years. Such sinks include peat bogs and the arctic tundra. But if these sinks destabilize, that carbon will be released, possibly causing an unstoppable and catastrophic warming of the Earth. The oceans are no longer able to store carbon as they have in the past. The ocean is a huge carbon sink, holding about 50 times as much carbon as the atmosphere. But now scientists are realizing that the increased thermal stratification of the oceans has caused substantial reductions in levels of phytoplankton, which store CO2. Increased atmospheric carbon is also causing an acidification of the ocean, since carbon dioxide forms carbonic acid when it reacts with water. The tiny plants of the ocean, the very bottom of that vast watery food chain, are suffering from the effects of global warming, which means they are becoming less able to store carbon, further contributing to climate change. As carbon sinks fail, the amount of carbon in the atmosphere climbs!

#### Ocean acidification will cause extinction

Romm 2012 (Joe Romm, Fellow at American Progress and is the editor of Climate Progress, March 2, 2012, “Science: Ocean Acidifying So Fast It Threatens Humanity’s Ability to Feed Itself,” http://thinkprogress.org/climate/2012/03/02/436193/science-ocean-acidifying-so-fast-it-threatens-humanity-ability-to-feed-itself/)

The world’s oceans may be turning acidic faster today from human carbon emissions than they did during four major extinctions in the last 300 million years, when natural pulses of carbon sent global temperatures soaring, says a new study in Science. The study is the first of its kind to survey the geologic record for evidence of ocean acidification over this vast time period. “What we’re doing today really stands out,” said lead author Bärbel Hönisch, a paleoceanographer at Columbia University’s Lamont-Doherty Earth Observatory. “We know that life during past ocean acidification events was not wiped out—new species evolved to replace those that died off. But if industrial carbon emissions continue at the current pace, we may lose organisms we care about—coral reefs, oysters, salmon.” That’s the news release from a major 21-author Science paper, “The Geological Record of Ocean Acidification” (subs. req’d). We knew from a 2010 Nature Geoscience study that the oceans are now acidifying 10 times faster today than 55 million years ago when a mass extinction of marine species occurred. But this study looked back over 300 million and found that “the unprecedented rapidity of CO2 release currently taking place” has put marine life at risk in a frighteningly unique way: … the current rate of (mainly fossil fuel) CO2 release stands out as capable of driving a combination and magnitude of ocean geochemical changes potentially unparalleled in at least the last ~300 My of Earth history, raising the possibility that we are entering an unknown territory of marine ecosystem change. That is to say, it’s not just that acidifying oceans spell marine biological meltdown “by end of century” as a 2010 Geological Society study put it. We are also warming the ocean and decreasing dissolved oxygen concentration. That is a recipe for mass extinction. A 2009 Nature Geoscience study found that ocean dead zones “devoid of fish and seafood” are poised to expand and “remain for thousands of years.“

# 1AC: Economic Leadership

#### We’re losing the renewable race

**Mormann ’11** (Felix, prof at Steyer-Taylor Center for Energy Policy and Finance, Stanford Law School, “Requirements for a Renewables Revolution,” 38 Ecology L.Q. 903)

The task of a timely transition to renewables is one of Herculean dimensions. The overall cost of a transition to an exclusively renewables-based electricity sector is estimated at around $ 100 trillion globally, not including the necessary investment in transmission infrastructure. n10 Some have compared the required effort to the 1960s Space Race. n11 In his 2011 State of the Union address, President Obama referred to the U.S. energy challenges as "our generation's Sputnik moment." n12 Others speak of an energy revolution. n13 Both views are right: the quest for the policy that best promotes the shift from fossil fuels to renewable sources of energy is an international competition over technological leadership in one of the fastest growing sectors of the global economy. As the example of Denmark's thriving wind turbine industry [\*907] illustrates, even a relatively small nation has a chance at dominating the world market when supported by a strong domestic renewables policy. n14 Against this competitive and time-constrained background, it is quite appropriate therefore to speak of a race to renewables similar to the 1960s Space Race. The magnitude of the task at hand requires the concerted efforts of more than just the scientific and engineering communities. Without the active involvement of economists, educators, and lawyers, the United States will not see a shift to renewables at the speed required to successfully mitigate climate change and will not place favorably in the race to renewables. Indeed, the necessary institutional and regulatory reforms are so far-reaching that they may well be described as a renewables revolution.

#### Other nations are locking in their positions, a FIT solves

Toby D. Couture et al 2010, E3 Analytics, Karlynn Cory, Claire Kreycik, National Renewable Energy Laboratory, Emily Williams, U.S. Department of State, July 2010 Technical Report, National Renewable Energy Laboratory, work was funded by the DOE, “A Policymaker’s Guide to Feed-in Tariff Policy Design,”

With their increasing worldwide adoption, feed-in tariffs are poised to play an important role in advancing the deployment of renewable energy technologies. Many early adopters of FIT policies have had success propelling their renewable energy (RE) sectors (measured in manufacturing capacity, job creation, etc.) and in rapidly expanding the share of RE in their overall electricity mix. In particular, the policy framework created by FIT policies has enabled

certain countries such as Germany and Denmark to become incubators of RE technology and innovation, and create export opportunities in RE markets around the world. Combined with a long-term commitment to a renewable energy future, these countries have begun to lock in their strategic position in the energy economy of the 21st century. New sectors and technologies are

beginning to emerge, which provides other jurisdictions with the opportunity to develop similar competitive advantages as the global marketplace for renewable energy technologies expands and evolves. Through an overview of different policy practices found around the world, this report provides a comprehensive overview of FIT policy options, while highlighting a few key elements of policy

success. These include:

• long-term policy stability;

• payments based on the costs of RE generation; • differentiating the tariff prices to account for different technologies, project sizes, locations, and resource intensities; • guaranteed grid access; • eligibility for all end-users and RE project developers (and sometimes utilities); and • a reliable must-take provision for the electricity generated. These elements provide the policy design framework for effective FIT policy implementation. In addition to these broader design elements, policy designers can include a number of other policy nuances that tailor the policy to local goals, resource availability, and particular policy objectives. The success of FIT policies has been attributed to the stability and certainty they offer for renewable energy investment (IEA 2008, Deutsche Bank 2009). These policies create an environment that is conducive to leveraging capital toward RE deployment, which provides an effective framework for the wider adoption of RE technologies. This translates into direct benefits for both RE project developers and manufacturers, as well as for society at-large through increased RE deployment, fewer environmental impacts, and increased job creation.

The benefits for project financing and RE investment are particularly worth noting: First, RE developers benefit from the long-term stability of the revenue streams generated from electricity sales, which helps foster a high level of investment security. Well-designed feed-in tariffs can help reduce risk, which can also help reduce the overall costs of RE development for society.

The stability of the framework makes it more likely for traditionally risk-averse investors to provide debt financing for RE projects, which can further improve the availability of capital. Second, the transparent policy structure also creates an open and straightforward framework that residents, businesses and investors can understand. This helps both local project developers as well as investors from around the world evaluate the posted FIT prices when making their investment decisions. Third, FITs allow efficiently operated projects to earn a reliable rate of return on renewable energy investments, which makes it possible for entrepreneurs, investors, and homeowners to invest in RE projects. This has proved to be a powerful way of unleashing capital toward deployment of renewable energy, and has enabled jurisdictions to harness a greater share of their domestically available RE potential. In addition to the financing benefits, manufacturers can also benefit in other ways from the framework created by FITs. The long-term stability of well-designed FIT policies helps manufacturers develop longer planning horizons, which can be a significant factor in determining both the location and the quantity of new RE manufacturing (Diekman 2008).

European Union (EU) experience suggests that the stability and longevity of the policy framework is essential to drawing large numbers of product manufacturers to an area. This has been a problem in the United States, because of the intermittence of the federal tax credits, which has been cited as a key barrier to the sustainable growth of the U.S. wind industry, in particular (Wiser et al. 2007, Kahn 1996, IEA 2008, Mendonça et al. 2009b). Another benefit is the direct competition for market share that is occurring under FIT policies in countries such as Germany, France, and Spain. This can drive greater private R&D investment, while helping spur further innovation and technological cost reduction (Diekman 2008, Hvelplund 2005).

#### **Delay would lock the US out of the market**

NREL December 2008 Report Number: NREL/TP-6A0-44261

National Renewable Energy Laboratory, “Strengthening U.S. Leadership of International Clean Energy Cooperation Proceedings of Stakeholder Consultations” http://www.nrel.gov/international/pdfs/44261.pdf

The estimated range of net economic benefits to the United States in 2020 is $30-80 billion per year, and the corresponding range for 2050 is $100-$300 billion per year. These estimates include all the benefits resulting from global cooperation to accelerate CET use. These domestic benefits cannot be achieved through U.S. efforts alone. Because climate change is a global challenge, these benefits will be realized only through coordinated efforts across countries, with the private sector, and with international institutions. U.S. participation is necessary, but not sufficient. U.S. leadership in such an initiative will also play a key role in helping U.S. CET firms capitalize on the significant opportunities presented by an expanded global CET market. While this analysis considers only those benefits derived from international cooperation, strong U.S. international leadership will complement domestic public and private actions, which will be required for the United States to adapt to the fundamental shifts in the energy system. Framing the Problem Scenarios The estimates described below were scaled by using the scenarios from the literature discussed above. The analysis combined the range of underlying trends described in those scenarios with economic forecasts and parameters to develop a range of economic benefits. Driving Forces In the scenarios mentioned above, the two key parameters, or “driving forces,” are central to the estimation of benefits: the increase in the size of the global CET market and the decrease in global demand for petroleum products.7 If the United States successfully captures some of the markets created by those two underlying changes, several types of benefits accrue to the U.S. economy as described in the next section. Estimating Benefits Nominal values8 of the two key parameters are derived from the above scenarios as follows: Increased U.S. net CET exports are derived from the increased levels of global investment in CET. First, we estimate the fraction of that increased investment that will occur outside the United States. That estimate represents the target market. Next, we estimate the fraction of that market that successfully positioned U.S. exporters could capture. The nominal value of the decrease in oil prices is estimated directly from the decrease in global petroleum demand. Sources of Benefits Benefits from Clean Energy Markets

Both U.S. producers and consumers stand to benefit from significant global shifts toward clean energy technologies. The first impact comes through an increase in the export of CET products by U.S. producers.

However, U.S. CET producers will benefit from increased sales overseas only if they are successful in positioning themselves in the global CET market. The importance of early and decisive actions to position U.S. industry in global markets cannot be overstated. The work by Paul Krugman (1991), for which he was awarded the 2008 Nobel prize in economics, describes one of the important ways countries that first enter a newly opened global market sector can develop significant and permanent cost advantages over later entrants.

Consumers can benefit from enhanced efforts in CET markets through lower CET prices. The CET initiative is posited to include enhanced R&D efforts that will reduce technology costs and improve performance. In addition, increased production will reduce prices through the learning curve effect. Increased CET demand will create a countervailing trend toward higher prices. Although, on balance, we expect CET prices to decline in the ex ante case, the range of benefit estimates accounts for the possibility that prices might increase.

#### A domestic market is key

Steven Chu, Secretary of Energy, CQ Transcriptions, Sen. Jeff Bingaman Holds a Hearing on Energy Department Budget, February 16, 2012 LN

CHU: Sure. Yes.

Very quickly, I think things like production tax credits are a way to stimulate moving forward to get deployment in the marketplace. And there -- because Europe is in -- I would say even perhaps even worse economic straits than we are, and you see some countries like Spain decreasing a lot of their feed-in tariffs, a lot of their subsidies for renewables, that there's a diminution of the market. But it's the local markets that actually help stimulate manufacturing in a particular country. And so the -- and this is why when Spain took away their subsidies, and other countries are decreasing, China put in feed-in tariffs for their market in wind and solar. So they ratcheted it up because they recognized that they want to nurture their industries. They need a home market to make sure that they're going to be -- they want to catch up in wind turbine technology. They are becoming a dominant force in solar technology, but they see both of those at risk. And so in -- as we saw Europe's subsidies decrease, they said, OK, we're going to have -- we want to develop our home market, and the world is expecting this year that China will be the biggest deployer of renewable energy in the world. Let's go back to the United States. If we don't have a home market for these things, industries would not be motivated to develop manufacturing at home. They would not -- they would be less motivated to develop those technologies, the next generation of solar. For example, you know, NREL was the developer, essentially inventor-developer, of the cad telluride cells. There's a number of solar companies making (inaudible) cad telluride technology. Those technologies are continuing to improve. One doesn't know whether silicon or cad tell or some other technology, but they're certainly a player in that field, and they're certainly in a competitive race. So I think to have a home market for clean energy standard, a production tax credit, those are mechanisms that can stimulate private sector investment that then stimulates manufacturing in the United States. And this is why, yes, China wants to export, but they also realize that we have to create a home market as well, and it's this mixture that they need. UDALL: And you're implying if we don't extend the PTC, that home market mission that we've all agreed in a bipartisan way is crucial? (CROSSTALK) CHU: Well, it goes to ways of, how do you get a market draw? How do you help bring slightly lower costs, financing these projects, all those things? You talk to any supplier of wind, they would rather set up a supply chain in the country where these things are being installed. This is heavy stuff. And so, in the solar world, it's more like a commodity that can be shipped worldwide, but it's going to heavily be influenced. Now, as wind technology, as I noted before, is getting very, very close to price parity with new gas -- new gas -- let me be careful. New gas at $4 to $6 a million cubic feet. Now -- which is considered -- you know, if you average over the next 10 or 20 years, this is what (inaudible) is projecting. Solar has dropped by more than 75 percent. The solar modules have dropped by more than 75 percent in the last three years. Everybody anticipates another 50 percent drop at least in the next five to eight years. And so solar is going to be competitive with any new form of energy. And so, again, we need -- we need to spur this market, because this could be -- this is clean energy without subsidy that the world will want. And as I've said repeatedly, we're either going to be buying or selling, and I'd rather be selling.

#### Robust renewable industry will promote exports, boosting US job growth

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National Renewable Energy Laboratory, “Strengthening U.S. Leadership of International Clean Energy Cooperation Proceedings of Stakeholder Consultations” http://www.nrel.gov/international/pdfs/44261.pdf

Economic and Market Benefits

U.S. leadership in clean energy markets will result in three types of direct economic benefits. First, U.S. clean energy businesses could increase their exports by up to $40 billion per year in 2020 and by $40-200 billion in 2050. Decreased oil global consumption will reduce oil prices relative to the baseline, saving U.S. consumers $10-50 billion in 2020 and $75-$200 billion in 2050. By improving the U.S. balance of trade and strengthening the dollar, the increased exports and decreased costs of oil imports will create up to $25 billion per year of additional savings in 2020 and up to $60 billion per year in 2050. Increased Clean Energy Exports U.S. leadership in promoting clean energy internationally would enable U.S. manufacturers to dramatically increase their exports, with gains of up to $40 billion in 2020 and $40-$200 billion per year in 2050. A robust U.S. clean energy industry will create significant new employment in the United States, between 250,000 and 750,000 jobs in 2020 and between 3 million and 8 million in 2050. Figure 1 illustrates the total growth in global renewable energy and energy efficiency markets and the corresponding increases in U.S. exports2 resulting from a global clean energy market transformation.

#### Global demand is high, US involvement boosts economic stability

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National Renewable Energy Laboratory, “Strengthening U.S. Leadership of International Clean Energy Cooperation Proceedings of Stakeholder Consultations” http://www.nrel.gov/international/pdfs/44261.pdf

Climate change, the growing demand for fossil fuel resources, energy security, and sustainable development issues are recognized worldwide as critical challenges that require immediate attention. These concerns have helped create a growing consensus that global energy systems need to undergo a fundamental transformation toward clean energy technologies in the coming decades. At the same time, U.S. leadership in global clean energy markets has declined and economic opportunities are being lost to other countries. Through revitalized international clean energy programs, the United States can reap substantial economic, energy security, environmental, and global sustainable development benefits. These benefits include: o Providing direct economic benefits to the United States—jobs, price reductions, economic stability, and enhanced trade balance o Speeding the rate of development and market introduction of advanced clean energy technologies o Enhancing the competitiveness of U.S. industry o Tackling climate change and energy security through international cooperation These benefits are summarized in Table 2 and presented in quantitative terms in the opportunity and benefits assessment section that follows.

#### Boosts Growth

NREL December 2008 Report Number: NREL/TP-6A0-44261

National Renewable Energy Laboratory, “Strengthening U.S. Leadership of International Clean Energy Cooperation Proceedings of Stakeholder Consultations” http://www.nrel.gov/international/pdfs/44261.pdf

The United States has an unparalleled opportunity to lead a global clean energy market transformation that will yield vital economic, energy security, environmental, and development benefits for the United States and the world as a whole. Concerted U.S. action, together with other partners, could generate up to $40 billion/yr. in new clean energy exports and 750,000 new jobs by 2020, along with $10 to 50 billion/yr. in additional savings from reduced oil prices and other critical economic and energy security benefits. Such a global clean energy market transformation is a necessary critical step in reducing worldwide greenhouse gas emissions by 50-80% by 2050, which is necessary to prevent dangerous climate change impacts. It also will foster revitalized economic growth and sustainable development in all regions of the world and ensure that all citizens worldwide have access to modern energy services.

#### Economic boons are huge

Dennis Spisak 2008 , Green party Candidate for State Representative-60th District, Progress Ohio blog quoting the Sponsors of Inslee’s FIT bill’s press release, “Finally, US House Introduces Feed-In-Tariffs” July 1, 2008

http://www.progressohio.org/blog/2008/07/C29c.html

U.S. Representatives Jay Inslee (D-WA), Bill Delahunt (D-MA), Jim McDermott (D-WA), and Mike Honda (D-CA) introduced landmark legislation last Thursday that will provide security for investments in the renewable-energy sector by guaranteeing rates for renewable-energy generation. This policy mechanism, also known as a national feed-in tariff, may be the single most effective tool to expand renewable energy development that we know of. International Energy Agency, the European Commission and the United Kingdom's Stern Review have determined that feed-in tariff policies in Germany, Spain, France and other European Union countries have achieved larger renewable energy deployment at lower costs, compared with policies in other European Union countries. The legislation has two principle titles. The first would streamline interconnection standards and the patchwork of policies currently governing interconnection. The second title addresses the actual process of setting of renewable energy tariffs, and what would qualify. This bill would not only apply to the mom and pop backyard wind turbines, and rooftop solar - the tariff extends to projects as large as 20 megawatts! As it is currently written, the tariff would be revisited no later than one year after it is enacted and every two years thereafter, thus incorporating a ratcheting mechanism that allows the rate-setters to adjust for technological advances, bottlenecks in supply chains, changes in demand, and other unforeseen stimuli that might necessitate a rate revision. According to a statement released by the bill's co-sponsors: "Enacting a federal renewable-energy payments policy would streamline what could become a patchwork regulatory structure and an unstable investment climate for the U.S. domestic renewable energy market. It also would complement incentives for renewable-energy deployment, such as existing federal-tax credits as well as proposed plans to cap carbon emissions and set federal renewable-electricity requirements, among others." Rep. Inslee added: "With hundreds of billions of dollars in capital slated for investment in the clean-energy sector in coming decades, we'd be fools if we didn't ensure American manufacturers would be on the receiving end of this rapidly growing market." Rep. Delahunt continued: "It is time for the United States to take a leadership role in the new 'clean energy' economy. By giving our own consumers access to proven financial incentives and boosting demand for clean energy technology we can position the United States to become a world leader in this emerging sector of the global economy that has the potential to create thousands of new 'green-collar' jobs here at home.

#### Green tech is unique and key to economic recovery

King, 12 [YaShekia King, January 2012, US Green Technology, “Green Technology Will Come to the Economy’s Rescue” (http://usgreentechnology.com/us-green-stories/green-technology-will-come-to-the-economys-rescue/)]

I wrote this article because when we look around at our economically devastated country, it is apparent that people need to be encouraged in this new year. People need to realize how beneficial green technology can be to them and how it really is part of all of our lives. If you are looking for a job in the modern economy, no other industry is paving the way for hundreds and thousands of new jobs in the same way that the green technology industry is. If you want to own or start your own business, what better way than to enter a field that is extremely promising – a field that is attracting a large number of venture capitalists who are willing to put money into early-stage and high-risk yet high-potential startup green companies. According to the Center for Small Business and the Environment, small green businesses actually are more capable of creating new jobs faster than large companies can and thus should be at the forefront of leading the nation’s economic recovery through clean energy technologies and green employment opportunities. In addition, if you own a home, businesses provide services to make your residence more energy-efficient, which positively affects your pocketbook. If you recycle, you also can make some extra change while additionally helping companies to save money and save the planet at the same time. By recycling, you essentially save trees in addition to saving space that otherwise would have to be dedicated to landfills.

#### And, Economic decline causes nuclear war

Burrows and Harris ‘09 (Mathew J. Burrows, counselor in the National Intelligence Council, PhD in European History from Cambridge University, and Jennifer Harris, a member of the NIC’s Long Range Analysis Unit, April 2009 “Revisiting the Future: Geopolitical Effects of the Financial Crisis” http://www.twq.com/09april/docs/09apr\_Burrows.pdf)

Of course, the report encompasses more than economics and indeed believes the future is likely to be the result of a number of intersecting and interlocking forces. With so many possible permutations of outcomes, each with ample opportunity for unintended consequences, there is a growing sense of insecurity. Even so, history may be more instructive than ever. While we continue to believe that the Great Depression is not likely to be repeated, the lessons to be drawn from that period include the harmful effects on fledgling democracies and multiethnic societies (think Central Europe in 1920s and 1930s) and on the sustainability of multilateral institutions (think League of Nations in the same period). There is no reason to think that this would not be true in the twenty-first as much as in the twentieth century. For that reason, the ways in which the potential for greater conflict could grow would seem to be even more apt in a constantly volatile economic environment as they would be if change would be steadier. In surveying those risks, the report stressed the likelihood that terrorism and nonproliferation will remain priorities even as resource issues move up on the international agenda. Terrorism’s appeal will decline if economic growth continues in the Middle East and youth unemployment is reduced. For those terrorist groups that remain active in 2025, however, the diffusion of technologies and scientific knowledge will place some of the world’s most dangerous capabilities within their reach. Terrorist groups in 2025 will likely be a combination of descendants of long established groupsinheriting organizational structures, command and control processes, and training procedures necessary to conduct sophisticated attacksand newly emergent collections of the angry and disenfranchised that become self-radicalized, particularly in the absence of economic outlets that would become narrower in an economic downturn. The most dangerous casualty of any economically-induced drawdown of U.S. military presence would almost certainly be the Middle East. Although Iran’s acquisition of nuclear weapons is not inevitable, worries about a nuclear-armed Iran could lead states in the region to develop new security arrangements with external powers, acquire additional weapons, and consider pursuing their own nuclear ambitions. It is not clear that the type of stable deterrent relationship that existed between the great powers for most of the Cold War would emerge naturally in the Middle East with a nuclear Iran. Episodes of low intensity conflict and terrorism taking place under a nuclear umbrella could lead to an unintended escalation and broader conflict if clear red lines between those states involved are not well established. The close proximity of potential nuclear rivals combined with underdeveloped surveillance capabilities and mobile dual-capable Iranian missile systems also will produce inherent difficulties in achieving reliable indications and warning of an impending nuclear attack. The lack of strategic depth in neighboring states like Israel, short warning and missile flight times, and uncertainty of Iranian intentions may place more focus on preemption rather than defense, potentially leading to escalating crises Types of conflict that the world continues to experience, such as over resources, could reemerge, particularly if protectionism grows and there is a resort to neo-mercantilist practices. Perceptions of renewed energy scarcity will drive countries to take actions to assure their future access to energy supplies. In the worst case, this could result in interstate conflicts if government leaders deem assured access to energy resources, for example, to be essential for maintaining domestic stability and the survival of their regime. Even actions short of war, however, will have important geopolitical implications. Maritime security concerns are providing a rationale for naval buildups and modernization efforts, such as China’s and India’s development of blue water naval capabilities. If the fiscal stimulus focus for these countries indeed turns inward, one of the most obvious funding targets may be military. Buildup of regional naval capabilities could lead to increased tensions, rivalries, and counterbalancing moves, but it also will create opportunities for multinational cooperation in protecting critical sea lanes. With water also becoming scarcer in Asia and the Middle East, cooperation to manage changing water resources is likely to be increasingly difficult both within and between states in a more dog-eat-dog world.

# Plan

**The United States Federal Government should establish a feed-in tariff that requires electricity utilities to offer long-term contracts for wholesale electricity from solar and wind sources at a fixed premium above the wholesale market price of electricity.**

# 1AC: Solvency

#### Mismatched State policies undermines renewable deployment – now is key

**Kopetsky ‘8** (Brad A., J.D. U of Wisconsin Law School, “Deutschland Uber Alles: Why German Regulations Need to Conquer the Divided U.S. Renewable-Energy Framework to Save Clean Tech (And the World),” 8 Wis. L. Rev. 941)

Global warming, threats to energy security, and rising energy costs have become unavoidable in today's world of political turmoil and eco-awareness. n1 Each day the world's reliance on carbon-based fuels and waning natural resources causes further environmental damage and brings us closer to the day the (oil) wells literally run dry. n2 Frighteningly, the situation is only set to get worse as world energy [\*943] demand grows rapidly into the foreseeable future, fueled by population increases and economic growth. n3 While conservation was the tool of choice in dealing with past energy crises, n4 the newfound demand explosion indicates a need for new solutions. n5 As a result, technophiles and investors are increasingly teaming to solve today's energy crisis through innovations in clean technologies ("clean tech"). n6 Clean tech represents a critical factor in solving the current crisis, as it alone can meet increasing energy demand without further environmental repercussions. n7 Despite compelling evidence of their need, many clean technologies have not yet reached commercial viability to attract traditional financing. n8 Venture capital n9 has thus played a vital role in the [\*944] industry's inherently risky infancy. n10 In fact, venture capital dollars have recently flowed heavily into clean tech as investors have been excited at its prospects. n11 However, periods of widely accessible investment capital cannot last ad infinitum, n12 and the capital flow faces an invisible headwind from the piecemeal U.S. renewable-energy framework. While governments across the globe have begun in earnest to create progressive energy policies, n13 U.S. law in this area has generally been impractical, inefficient, and inconsistent. In fact, the Energy Policy Act of 2005 ("2005 Energy Act" or "the Act") created the first [\*945] true U.S. energy policy in more than a decade. n14 A substantial part of the Act addressed the use and development of renewable energy through clean tech, n15 but it stopped short of any strict, national requirements for alternative-energy usage. n16 As a result, states are left to make the majority of these decisions, and a Frankensteinian amalgamation of regulations now governs an increasingly national (and even global) energy market. n17 This state-by-state framework significantly hampers innovation in the U.S. clean-tech space. n18 Differing renewable-energy laws in each state fragment the market and create an undesirable level of uncertainty for investors and entrepreneurs. n19 Furthermore, while the objectives of many states' renewable-energy laws are admirable, their means oftentimes do not optimize the clean-tech capital development required to accomplish those goals. This Comment argues that **the United States must** follow the lead of other progressive nations by enacting **a national, demand-pull,** n20 **renewable-energy scheme to foster clean-tech capital formation and innovation. Without this stimulation, the prospects are dim for advancing clean tech to sufficiently meet the current energy concerns.** n21 Part I examines clean tech's contributions to solving these issues and outlines venture capital's role as a barometer of investment and innovation in such technologies. Part II illustrates the constraint on U.S. capital formation in the clean-tech area. Part III reviews federal regulatory responses to the energy crisis, and critiques their failure to incentivize clean-tech investment and innovation. Similarly, Part IV examines various state responses and the flaws of state autonomy in this area. Next, Part V provides a case study of two recently enacted Illinois statutes, which are timely examples of the problems present in many [\*946] state laws. Finally, Part VI discusses the cohesive renewable-energy framework the United States should adopt. The proposal mirrors the German Renewable Energy Sources Act, n22 which has been very successful and used as a model in many developing nations. n23

**All other incentives and policies will fail – A federal feed in tariff will result in rapid deployment and development of renewables**

**Ferrey et al. ’10** (Steven, law prof at Suffolk, Chad Laurent JD at Suffolk, Cameron Ferrey president of Computers Across Borders, “Fire and Ice: World Renewable Energy and Carbon Control Mechanisms Confront Constitutional Barriers,” 20 Duke Envtl. L. & Pol'y F. 125)

It is estimated that roughly half of new renewable energy power capacity in the United States over the last decade has [occurred] in states with RPS programs in place [which constitute about 40% of the states]. Over 90% of these capacity additions have come from wind power, with biomass and geothermal resources in second and third position ... . The National Renewable Energy Laboratory has estimated that RPS programs may result in only 8 to 12 GW of new wind capacity (about 1% of U.S. installed total capacity) relative to a base case where no RPS programs existed. Therefore, the total contribution of RPS programs appears modest in terms of total U.S. power resources. n225 This may be because portfolio standards allow market forces to work; developers will develop the most cost-effective and reliable renewable technologies eligible under a state program. SBCs, on the other hand, may be directed at experimental, politically favored or less cost-effective projects. The total expected renewable capacity added by RPSs and SBCs in those states that have adopted them will be dwarfed, making up less than ten percent of the total expected increases in U.S. electric system non-renewable capacity during the first decade of the new century, and will be less than 1% of total United States electric capacity. n226 Nonetheless, in a number of states, including Massachusetts, Nevada, Arizona, New York and California, new renewable energy project developments are not currently on track to meet mandatory RPS targets for renewable generation as a percentage of total retail load. n227 In some states, there are extensive exemptions from the RPS purchase mandate or excuses for retailers not to obtain otherwise required RECs along the lines of force majeure have been developed. n228 In several states regulatory commissions retain broad discretion to [\*166] grant waivers to regulated entities that do not comply with state RPS requirements. n229 Very open-ended waiver or excuse provisions exist in the RPS programs in Arizona, n230 Hawaii, n231 Minnesota, n232 and Pennsylvania. n233 In some states, such as Massachusetts, where RECs have traded in excess of $50 per MWh, RECs have been sold for as much as the value of the power generated. n234 In such situations, the forward-monetized value of RECs is a critical component of renewable energy financing. n235 However, unless there is the ability to monetize these credits through long-term contracts or some variety of credit support mechanisms, the forward value of this revenue stream may not be translatable into project financing. REC prices under long-term contracts are significantly lower (closer to the $25 range) than the short-term spot market prices, which hover around the ACP rate. n236 Ambiguity in definitions allowed the Connecticut DPUC to exempt two of the state's largest utilities from state RPS obligations. n237 Other states, such as Massachusetts, require regulated utilities to sign long-term power purchase contracts with renewable energy projects that qualify to produce RECs. n238 Nevada has established a fund to guarantee utility power purchase contracts that would cover RECs [\*167] purchases. n239 Massachusetts utilizes its renewable trust fund to offer various types of credit support for future RECs of eligible projects at the development stage. n240 All of these incentives, particularly state RPS standards have failed to substantially increase the deployment of renewable energy technologies on a national scale. Non-hydroelectric renewable energy resources continue to hover around 2% of the U.S. electricity supply. Therefore, while various renewable technologies are projected to double or triple their gross amount of power contribution, this is not projected to have a significant impact for two reasons. First, these renewable technologies are starting from a very small base, so that even a large percentage increase translates to a relatively small absolute increase. Second, electricity demand in the United States is increasing, so the contribution of any given project is a progressively smaller percentage of the increasing generation base. n241 Even if states effectively implemented all of their existing RPS mandates, emissions would be reduced by between 1% and 1.5% from business-as-usual scenarios by 2015 to 2020. n242 Non-hydroelectric renewable energy deployment is expected to rise from about 2% to [only 3% by 2015 and] 4% by 2030. Fossil-fired energy resources are projected to maintain a roughly 70% share of total electric generation in the United States and an 86% share of total U.S. primary energy supply (including the transportation sector) in 2030. Therefore, a radical departure is not projected by the U.S. government between [2005] and 2030 in fossil fuel use. n243 Many of the REC obligations are short-term, and therefore are not supporting long-term financing of eligible renewable resources that would satisfy the RECs mandate. So, the forecast is that the RPS [\*168] system is not meeting its targets in several states, and is not expected, alone, to meet the renewable power goals that it embodies. There is an obvious connection between RPS renewable power programs and goals for carbon reduction strategies. "That RPS mandates are primarily carbon reduction mandates seems relatively clear ... . This seems to be their primary perceived benefit." n244 However, a criticism of an RPS system is that much more cost-effective carbon reductions would be achieved by a carbon cap-and-trade system, resulting in greater reductions at one-third the cost per ton of carbon saved. n245 In other words, renewable power generation may not be the low-hanging fruit, as is energy conservation, for the least expensive carbon reduction. n246 RPS renewable power requirements also are not necessarily seen as additional carbon reductions, as they are assumed to become a component of the overall carbon cap achievement. n247 A cap-and-trade carbon reduction program does not guarantee that any renewables will be constructed. However, long-term, electric power is the essential sector for carbon reduction and investments in power generation are long-term infrastructure realities. n248 As opposed to an RPS system, some countries in Europe and elsewhere instead promote renewable generation with feed-in tariffs outside of the carbon reduction or cap programs. Assuming that full compliance is achieved, current mandatory state RPS policies, in just those states that have them, will require the addition of roughly 60 GW of new renewable energy capacity by 2025, n249 an amount equivalent to 4.7% of projected 2025 electricity generation in the United States and fifteen percent of projected electricity demand growth. n250 It is not thought to be practically achievable to have the various RPS projects around the country install the required additional 60 GW of new generation. n251 The congested and limited state of transmission infrastructure to move renewable power from generation site to market causes some to state [\*169] that these requirements cannot be achieved within specified time frames. n252 Therefore, with the underachievement of tax incentives, state subsidy programs, and state RPS requirements, thought has recently turned to a third alternative, feed-in tariffs for renewable power development. Feed-in tariffs have been used by various foreign countries and are being considered by several U.S. states. As additional states experiment with European-type feed-in tariffs, discussed below, it becomes crucially important to understand the legal implications and legality of a feed-in tariff model implemented in the United States at the state level. However, this option may not be legal under U.S. constitutional law. VI. Feed-In Tariffs as the Alternative Renewable Power Mechanism Feed-in tariffs are the most widely employed renewable energy policy in Europe and, increasingly, the rest of the world. n253 As of 2006, seventeen European Union countries, as well as Brazil, Indonesia, Israel, South Korea, Nicaragua, Norway, Sri Lanka, Switzerland and Turkey all used feed-in tariffs to promote and support renewable energy. n254 In March of 2008, the Kenyan Ministry of Energy proposed the adoption of feed-in tariffs for wind, biomass and small-hydro resources. n255 A feed-in tariff establishes a secure contract for wholesale electricity at a set price that results in a rate of return attractive to investors and developers. n256 Feed-in tariff structures are typically either fixed payments based on an electricity generator's cost to produce electricity, or as a fixed premium paid above the spot market [\*170] or wholesale market price of electricity. n257 These fixed payments are long-term contracts for anywhere from five to thirty years in duration. n258 Feed-in tariffs increase the price of certain renewable technologies to an amount that is deemed administratively and politically necessary to encourage their development. Feed-in tariffs typically may exceed utility-avoided costs, and therefore are justified only by their objectives and results, and not typically by accepted ratemaking methodology, which aims to minimize prudent generating costs. n259 Often fixed-payment feed-in rates and terms are differentiated by technology and are based on the cost of deploying a given renewable energy technology. n260 Feed-in tariffs for sale of renewable power typically decline over time as the high front-end capital costs of renewable energy are amortized and as the number of installed systems increases. n261 Feed-in tariff laws usually also guarantee interconnection for distributed generation and utility scale projects. n262 Feed-in tariffs have been successful in encouraging significant renewable energy development in nearly all of the countries in which they have been deployed. n263 The high initial capital costs of permitting and construction can hinder the development of renewable technologies, while feed-in tariff price premiums can help to offset the risk associated with those high capital costs. n264 Feed-in tariffs offer a fixed price long term contract for payment from utility or electricity suppliers to the wholesale renewable energy generator. n265 The structure of a feed-in [\*171] tariff can be either a long term payment based on the cost of generation - including profit - or a premium added on to the wholesale or spot-market price of electricity. So long as a generator feeds power onto the grid, it is guaranteed a long-term contract at the government mandated feed-in price for the renewable energy commodity. A feed-in tariff also can be structured to reflect the benefits that renewable energy sources provide that are not reflected in traditional fossil fuel resource-based pricing structures, including pollution costs, climate change costs, security costs, and future fossil fuel cost-uncertainty. n266 Costs of a feed-in tariff are passed on to consumers by purchasing energy suppliers and reflect a public policy decision to increase the percentage of renewable electricity sources in use. There are myriad reasons to increase the percentage of renewable energy in a supply portfolio, including diversified domestic energy security, greater energy independence from imported supplies, local job and technology growth, reduction in pollution, and reduction of environmental damage from fossil fuel-generated electricity. n267 The European experience justifies feed-in tariffs as a cost-effective technique, which promotes innovation and a healthy investment environment for renewable energy technologies. n268 Germany, Denmark, and Spain, while only a small fraction of the size of the United States in square miles, were responsible for fifty-three percent of total installed global wind power capacity between 1990 and 2005. n269 Denmark receives nearly 20% of its energy from wind power; Germany receives 5% of its energy from wind power and will meet its goal of 12.5% renewable electricity by 2009, a year earlier than expected. n270 Germany's feed-in tariff program has created one of the world's largest solar energy markets, and Spain is close behind. n271 The policy experience in Europe has also found feed-in tariffs to be less risky, less costly, and more efficient than other types of renewable incentives, such as RPSs or other minimum percentage requirements. n272 These benefits have in turn led to increases in [\*172] domestic production and manufacturing of renewable technologies and the creation of jobs in the renewable energy sector. For example, Germany created 235,600 jobs in the renewable energy sector in 2006, a fifty percent increase from 2004. n273 The solar energy market in Germany has increased rapidly. n274 The European debate on renewable energy incentives has considered both feed-in tariff policies and RPSs. According to Rickerson and Grace, Italy, Sweden, and the United Kingdom initially favored RPSs, while Germany, Spain, and other countries favored feed-in tariffs. n275 Consequently, Germany has 200 times the installed solar capacity and ten times the number of renewable energy jobs created as the U.K. n276 In Germany, the current debate is whether the expense of feed-in tariffs is too high compared to what the public is willing to support. n277 The average German electric bill has increased by roughly $3 per month ( ( [euro] 1.45/month) n278 over the period of feed-in tariff implementation. n279 The German public has generally supported the increase, especially since many individuals have taken advantage of the incentives to install their own renewable energy generation systems. n280 Overall, renewable energy installations saved 114 million tons of CO(2) in Germany in 2007. n281 For the renewable energy developer, the feed-in tariff decreases investment risk by guaranteeing an investor or developer a long-term contract at a secured price with a return on investment of eight to nine percent. n282 By contrast, RPS policies require developers and [\*173] investors to secure contracts, which may not be long-term, for energy and for RECs. Finding long-term contracts for two commodities in two different markets injects more risk for investors. Research by the Fraunhofer Institut found that capital costs for renewable energy investments are significantly lower in countries using feed-in tariffs than in those countries using policies that create higher risks of future return on investment. n283 The European Commission concluded that feed-in tariffs are more effective than quota-based systems like RPSs. n284 Feed-in tariffs feature government-established fixed prices. Rickerson and Grace argue that feed-in tariffs create as much competition as RPS REC policies - the competition is just directed via a different mechanism. n285 RPS policies create a market for RECs, competitively rewarding renewable energy projects through the sale price of RECs. Developers and investors want the REC to be priced so as to fill the gap between what is needed to attract investors to the sector via a healthy return on investment and the current wholesale transaction price for the generator's electricity alone. Feed-in tariffs, however, set and guarantee higher electricity rates; investors compete to build the most cost-effective renewable energy projects and therefore receive the highest return on investment. With feed-in tariffs, the government sets the price and guarantees interconnection and contract security, while the market determines the amount of renewable energy projects put into operation at that price level. Feed-in tariffs, when successfully implemented, create a race to produce the least expensive and most efficient projects. The lower the project cost, the higher the return on investment guaranteed by the feed-in tariff rates.

#### FITs provide market stability resulting in rapid deployment of renewable tech

Toby D. Couture et al 2010, E3 Analytics, Karlynn Cory, Claire Kreycik, National Renewable Energy Laboratory, Emily Williams, U.S. Department of State, July 2010 Technical Report, National Renewable Energy Laboratory, work was funded by the DOE, “A Policymaker’s Guide to Feed-in Tariff Policy Design,”

Feed-in tariffs (FITs) are the most widely used policy in the world for accelerating renewable energy (RE) deployment, accounting for a greater share of RE development than either tax incentives or renewable portfolio standard (RPS) policies (REN21 2009). FITs have generated significant RE deployment, helping bring the countries that have implemented them successfully to the forefront of the global RE industry. In the European Union (EU), FIT policies have led to the deployment of more than 15,000 MW of solar photovoltaic (PV) power and more than 55,000 MW of wind power between 2000 and the end of 20091 (EPIA 2010, GWEC 2010). In total, FITs are responsible for approximately 75% of global PV and 45% of global wind deployment (Deutsche Bank 2010). Countries such as Germany, in particular, have demonstrated that FITs can be used as a powerful policy tool to drive RE deployment and help meet combined energy security and emissions reductions objectives (Germany BMU 2007).

This policymaker’s guide provides a detailed analysis of FIT policy design and implementation and identifies a set of best practices that have been effective at quickly stimulating the deployment of large amounts of RE generation. Although the discussion is aimed primarily at decision makers who have decided that a FIT policy best suits their needs, exploration of FIT policies can also help inform a choice among alternative renewable energy policies. This paper builds on previous analyses of feed-in tariff policy design, most notably by Resch et al. 2006, Klein et al. 2008, Held et al. 2007, Ragwitz et al. 2007, Grace et al. 2008, Mendonça 2007, and Mendonça et al. 2009a. It also provides a more detailed evaluation of a number of policy design options than is currently found elsewhere in the literature. This report considers both the relative advantages and disadvantages of various design options for FITs.

Drawing on the literature cited above, this paper explores experience with feed-in tariff policies from the European Union, where the policy has been used for approximately two decades, as well as recent examples of FIT policies in Canada and the United States. The focus on previous implementation provides valuable lessons for FIT policy design that could help improve future policy application. A feed-in tariff drives market growth by providing developers long-term purchase agreements for the sale of electricity generated from RE sources 2 (Menanteau et al. 2003, IEA 2008). These purchase agreements, which aim to be both effective and cost-efficient,3 typically offer a specified price for every kilowatt-hour (kWh) of electricity produced and are structured with contracts ranging from 10-25 years (Klein 2008, Lipp 2007). In order to tailor FITs to a range of policy goals, the payment level can be differentiated by technology type, project size, resource quality, and project location. The payment levels can also be designed to decline for installations in subsequent years both to track and to encourage technological change (Langniss et al. 2009, Fouquet and Johansson 2008). As an alternative to a fixed tariff level, FIT payments can be offered as a premium, or bonus, above the prevailing market price (IEA 2008, Rickerson et al. 2007).

Criteria for judging the success of feed-in tariffs depend on the policy goals of the jurisdiction. In the EU, national energy policies are evaluated against a comprehensive set of objectives laid out within EU-wide Directives, and include (among others) long-term RE targets, increased economic and export market opportunities, sustainable job creation, the enhanced use of forestry and agricultural wastes, and the expansion of innovative RE technologies (see European Commission, 2009/28/EC). Naturally, different jurisdictions may have different objectives, or may attribute different strategic importance to those same objectives. This notwithstanding, it is a common goal of FIT policies in both the EU and around the world to encourage RE deployment. Successful feed-in tariffs can, therefore, be understood as policies that encourage rapid, sustained, and widespread RE development.5 FIT policies typically include three key provisions: (1) guaranteed access to the grid; (2) stable, long-term purchase agreements (typically, about 15-20 years); and (3) payment levels based on the costs of RE generation6 (Mendonça 2007). In countries such as Germany, they include streamlined administrative procedures that can help shorten lead times, reduce bureaucratic overhead, minimize project costs, and accelerate the pace of RE deployment (Fell 2009, see also de Jager and Rathmann 2008). Many European countries have committed to using FIT policies to achieve their long-term RE targets out to and beyond 2020, which indicates a long-term commitment. In addition, European policies typically extend eligibility to anyone with the ability to invest, including – but not limited to – homeowners; business owners; federal, state, and local government agencies; private investors; utilities and nonprofit organizations (Germany BMU 2007, Lipp 2007, Mendonça et al. 2009b).